

# The genus *Raillietia* Trouessart in Australia (Acari: Dermanyssidae)

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*Raillietia*, confined to the auditory meatus of mammals, is represented in Australia by three species. Supplementary descriptive notes are given for *R. australis* Domrow from a wombat, *Vombatus ursinus* (Shaw) (Marsupialia: Vombatidae) and *R. auris* (Leidy) from the cow, *Bos taurus* Linnaeus (Artiodactyla: Bovidae). *R. manfredi*, n. sp., is figured and described from the goat, *Capra hircus* Linnaeus (Bovidae: Caprinae). A key to the females of the five known species is given.

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## INTRODUCTION

Three species of *Raillietia* Trouessart are now known to occur in the ears of native and introduced mammals in Australia. The descriptions are completed of the somewhat atypical *R. australis* Domrow, both known series of which are from a marsupial, and of the widespread *R. auris* (Leidy), a cause of *otitis media* in cattle (Domrow, 1963; Ladds *et al.*, 1972). A new species (*R. manfredi*) from the goat is yet another of the parasitic mites found only recently on domesticated animals [*e.g.* *Trixacarus caviae* Fain, Hovell and Hyatt, 1972 (Sarcoptidae) from the guinea-pig, and *Lynxacarus radovskyi* Tenorio, 1974 (Listrophoridae) from the cat].

The two other known species (*R. hopkinsi* Radford, 1938 and *R. whartoni* Potter and Johnston, 1978, both from African bovids) are beyond the scope of this paper, as is the genus *Rhodacantha* Domrow, 1979\* from the ears of Australian dasyurid marsupials.

The term 'holotrichous' refers to the setal condition in typical free-living dermanyssids (Evans and Till, 1965; Evans, 1969). The hosts' names are given after Simpson (1945) and Ride (1970).

Depositories are abbreviated: ANIC, Australian National Insect Collection, CSIRO, Canberra; BMNH, British Museum (Natural History), London; QIMR, Queensland Institute of Medical Research, Brisbane; RVL, Regional Veterinary Laboratory, Wollongbar.

## Genus *RAILLIETIA* Trouessart

*Raillietia* Trouessart, 1902: 1335. Type-species *Gamasus auris* Leidy.

The larval structures described below support Radovsky's (1969) placement of the Raillietiinae in the Halarachninae. Evans and Till (1966) gave an extended diagnosis for *Raillietia*; additional characters may be culled from Zumpt and Till's (1961) key.

Key to females of *Raillietia*

Based in part on original descriptions.

1. Dorsal shield with 19 and 15 pairs of setae on

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\*In this paper, read seta for setae at line 51, page 118; and  $Z_{2,4}$  for  $Z_{2-4}$  at line 6, page 121.

- podonotal and opisthonotal portions, respectively.  
Trochanter I and femora I, III holotrichous. Tibia  
I with seta  $pv_2$  added. From a wombatid  
(Marsupialia) . . . . . *australis*  
Dorsal shield with 10 and at most seven pairs of  
setae on podonotal and opisthonotal portions,  
respectively. Trochanter I and femora I, III  
unideficient. Tibia I with seta  $pv_2$  added or not.  
From bovids (Artiodactyla) . . . . . 2
2. Dorsal shield with 17 pairs of setae. Tibiae  
hypertrichous. From a caprine . . . . . *manfredi*  
Dorsal shield with at most 15 pairs of setae. Tibiae  
at most holotrichous. From bovids . . . . . 3
3. Dorsal shield with at least 13 pairs of setae. Tibia  
IV holotrichous. From species of *Kobus* Smith . . . . . 4  
Dorsal shield with 12 pairs of setae. Tibia IV  
unideficient. From *Bos* Linnaeus . . . . . *auris*
4. Dorsal shield with 15 pairs of setae. Genital setae  
on margin of genital shield. Setae on tarsus II  
normal . . . . . *hopkinsi*  
Dorsal shield with 13 pairs of setae. Genital setae  
free of margin of genital shield. Setae  $ad_{2-4}$  on  
tarsus II hypertrophied . . . . . *whartoni*

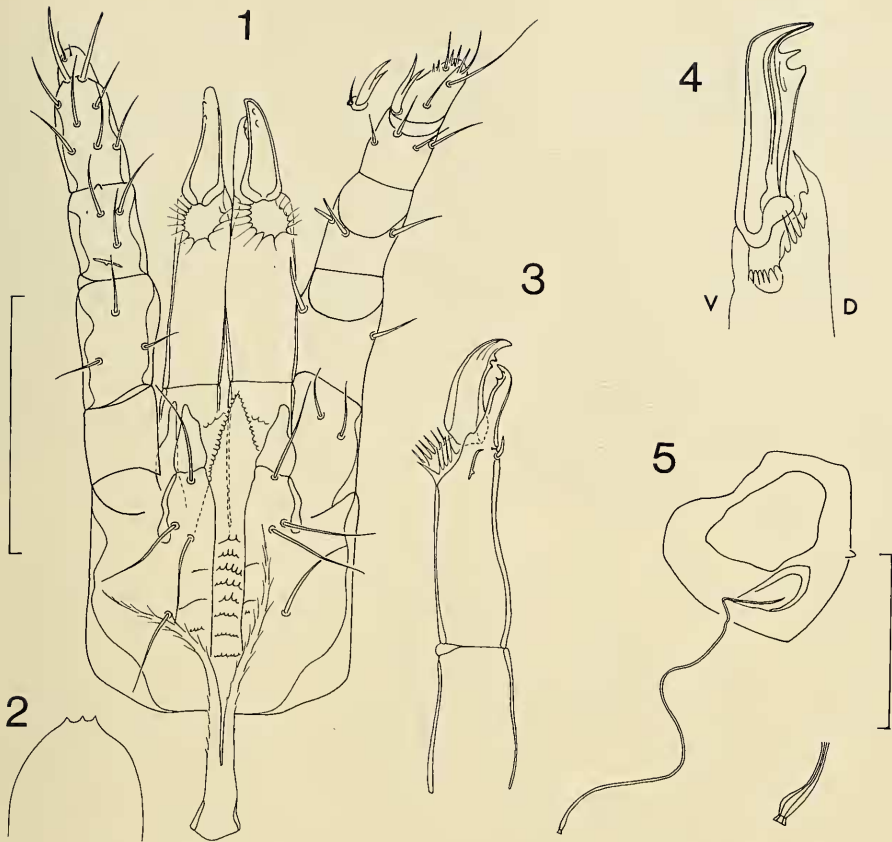
*Raillietia australis* Domrow  
(Figs 13-14)

*Raillietia australis* Domrow, 1961: 75; 1973: 79.

*Types.* Holotype ♀ and one paratype ♀, in ears of common wombat, *Vombatus ursinus* (Shaw) (Marsupialia: Vombatidae), Brindabella Road, A.C.T.-N.S.W. border, 24.v.1960, J. H. Calaby. Holotype in ANIC, paratype in BMNH (both reexamined).

*Other material.* One ♀, *V. ursinus*, near Taggerty, Vic., 26.vii.1971, R. C. H. Shepherd. In QIMR (reexamined).

*Female.* Add to original description [Potter and Johnston's (1978) setal counts for dorsal shield and tibia I are wrong]: Chelicerae, although still dorsoventrally orientated, now seen to be very similar to those of *Mesolaelaps* Hirst (see Tenorio and Radovsky, 1974); 270  $\mu\text{m}$  long overall, shaft 45  $\mu\text{m}$  in diameter, with digits occupying 27% of total length; middle segment with distinct dorsal setule and lyriform pore (external lyriform pore not detected), and ventral corona; fixed digit with pilus dentilis short and stiff, outwardly directed, set between tip of digit (shaped to receive tip of movable digit) and single low tooth placed well beyond midlength of digit; movable digit subequal to fixed digit, 70-75  $\mu\text{m}$  long, with two low teeth placed just beyond midlength. Epistome lobate, with lightly serrate margin not reaching far beyond level of palpal trochanters; disc with extensive dendritic pattern. Labial cornicles 'not very strong' *cf.*, say, the predatory *Hypoaspis* Canestrini, but actually well sclerotized; internal malae a single triangle with fringed margin barely exceeding tips of labial cornicles; epipharynx minutely ciliated around marginal strip, longitudinally striate in midline; salivary stylets present; anteromedial extension [see Evans and Loots (1972, 1975); this is 'labrum' of Gorirossi Bourdeau (1956)] of



Figs 1-5. *Raillietia manfredi*. 1. Capitulum ♀, ventral (true right palp dorsal). 2. Epistome ♀. 3. Chelicera ♀, external. 4. Cheliceral digits ♂, ventrointernal. 5. Coxa III and insemination apparatus ♀, dorsal. Scales = 100µm.

subchelicerar shelf distinct, with tip variable [holotype with two blunt points, paratype with three blunt points ending at same level, cf. *Mesolaelaps bandicoota* (Womersley, 1956) and *M. australiensis* (Hirst) as figured by Tenorio and Radovsky (1974)]. Palpi holotrichous: trochanter 2, femur 5, genu 6 ( $al_{1-2}$  spatulate,  $al_2$  absent on one side of paratype), tibia 14 (including two dorsodistal rods), tarsus 4 (plus terminal cluster of rods). All capitular setae, except the very shortest, barbulate along shaft (true also of setae on idiosoma and legs).

Dorsal shield [Fig. 28 in Domrow (1961) represents paratype] 700-770 µm long, 310-340 µm wide, ratio length/width 2.26-2.30, distinctly granulate (except on muscle insertions), hypotrichous, probably with 34 pairs of setae in normal specimens; podonotal portion with 19 pairs ( $s_2$  absent on both sides of paratype and on one side of holotype, but present on both sides of Taggerty specimen) compared to normal 22 (i.e. lacking  $z_3$ ,  $s_1$  and  $r_4$  — if setae acquired at protonymphal, rather than at deutonymphal, stage are taken as more likely to be represented in a reduced species); opisthonotal portion with 15 pairs ( $S_3$  absent on both sides of holotype, and  $S_4$  on one side of Taggerty specimen) compared to normal 17 (i.e. lacking intercalary  $px_{2-3}$ ).

Undivided portion of tritosternal laciniae lightly spiculate. Sternal shield of paratype with seta  $st_1$  absent on one side. Insemination apparatus not detected. Metapodal shields in two pairs just behind basifemora IV, inner pair equalling accessory genital shieldlets in size, outer pair rather larger. Anterior portion of peritrematalia originally figured in dorsoventral orientation [Fig. 27 in Domrow (1961) represents holotype], but actually more flared, though free of vertex of dorsal shield.

Leg setation holotrachous, with one exception: tibia I with fourth ventral seta ( $pv_2$ ) added, i.e. 2-3/2.3/2.2 rather than 2-3/2.3/1-2 ( $pv_{1-2}$  absent on one side of paratype). Tarsus I with dorsodistal sensory islet occupying 20% of length of segment.

*Notes.* It may be that this morphologically and zoogeographically distinct species (see key above) should be transferred from *Raillietia* (Halarachninae) to some laelapine genus near *Mesolaelaps* and *Rhodacantha*, whose hosts are also largely Australian marsupials rather than Old World artiodactyls. That is to say, in a complex so morphologically reduced and so little collected, the presence of seta  $pv_2$  on tibia I, once believed peculiar to these two Australian genera but now known also to occur in *Raillietia*, may as well be an adaptation to a habitat merely shared by unrelated lines as an indication of real relationships.

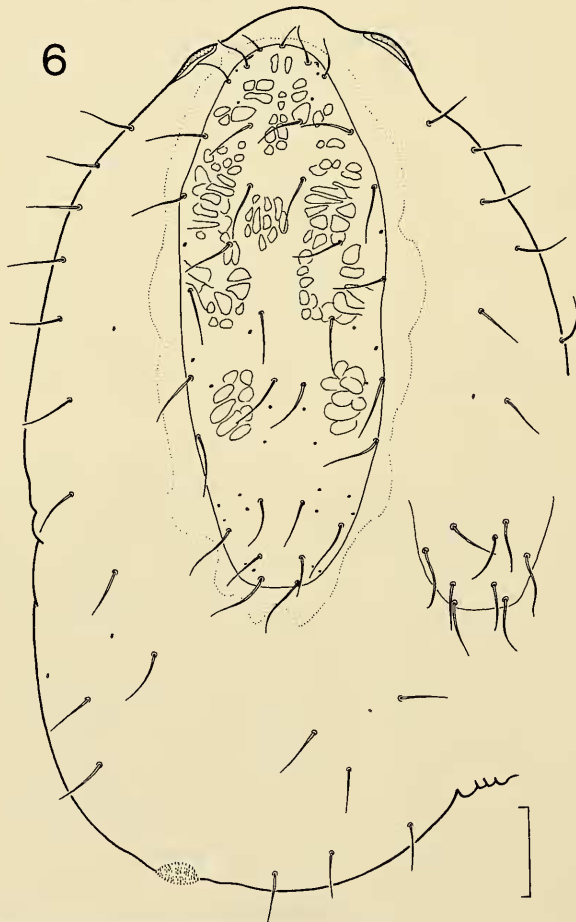
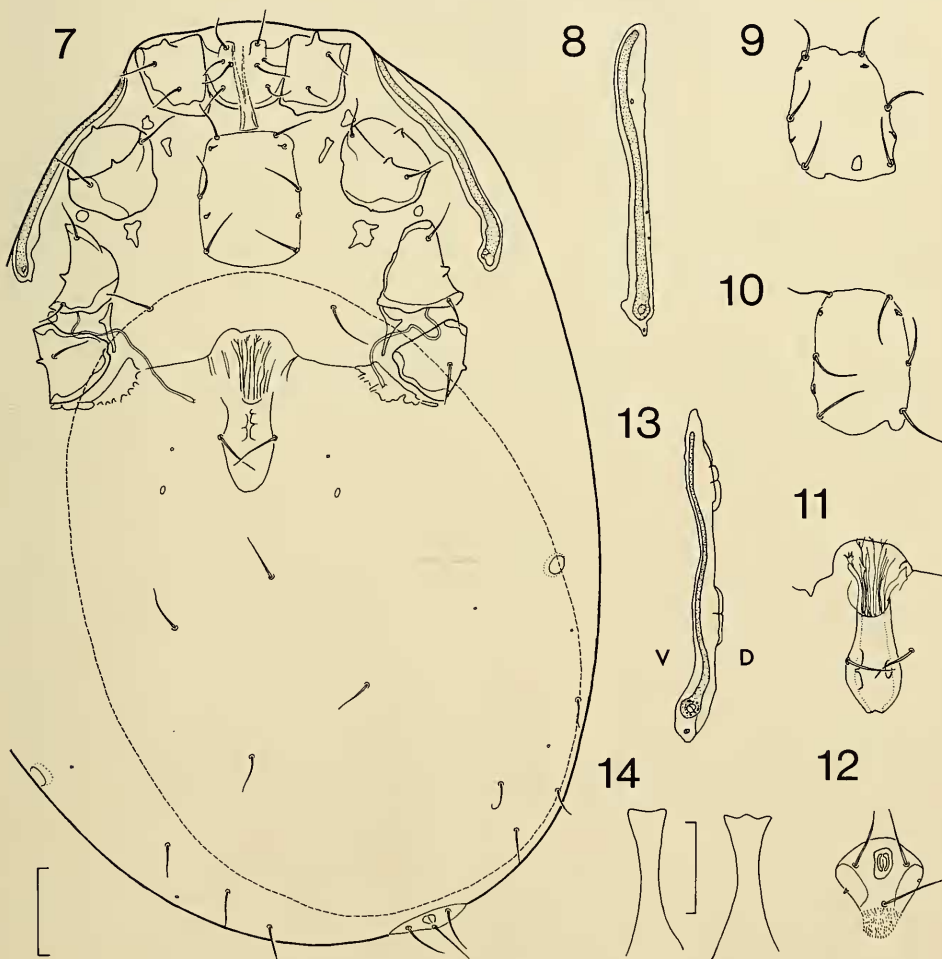


Fig. 6. *Raillietia manfredi* ♀. Idiosoma, dorsal. Scale = 100 $\mu$ m.

*Raillietia auris* (Leidy)*Gamasus auris* Leidy, 1872: 138.*Raillietia auris*: Freund, 1910: 313; Tzimbali and Litvishko, 1955: 1229.**Material.** Eight ♀♀, middle ear of domestic cattle, *Bos taurus* Linnaeus (Artiodactyla: Bovidae), Townsville, Qld, 11.v.1972, D. B. Copeman. In QIMR.**Female.** Palpal trochanter-genu holotrichous, tibia bifid (12, including two dorsodistal rods).Insemination apparatus as in *R. manfredi*.Legs with following deviations from holotrichous condition — hypotrichous: trochanter I 1-0/3-1 (*d* lacking), femur I 2-5/3-2 (one *pv* lacking), femur III 1-3/1-0 (*pl* lacking), tibia IV 2-4/2-1 (*pl*<sub>2</sub> lacking); hypertrichous: genu IV 2-5/1-2 (*pl*<sub>2</sub> added). Tarsus I with dorsodistal sensory islet occupying 25% of length of segment.

Figs 7-14. *Raillietia* spp. (7-12, *R. manfredi* ♀; 13-14, *R. australis* ♀). 7. Idiosoma, ventral. 8. Peritrematalia. 9-10. Sternal shield, variants. 11. Genital shield, variant. 12. Anal shield. 13. Peritrematalia. 14. Anteromedial extension of subchelicerel shelf, variants. Scale = 100 µm, except for Fig. 14 (25 µm).



*Raillietia manfredi*, n. sp.

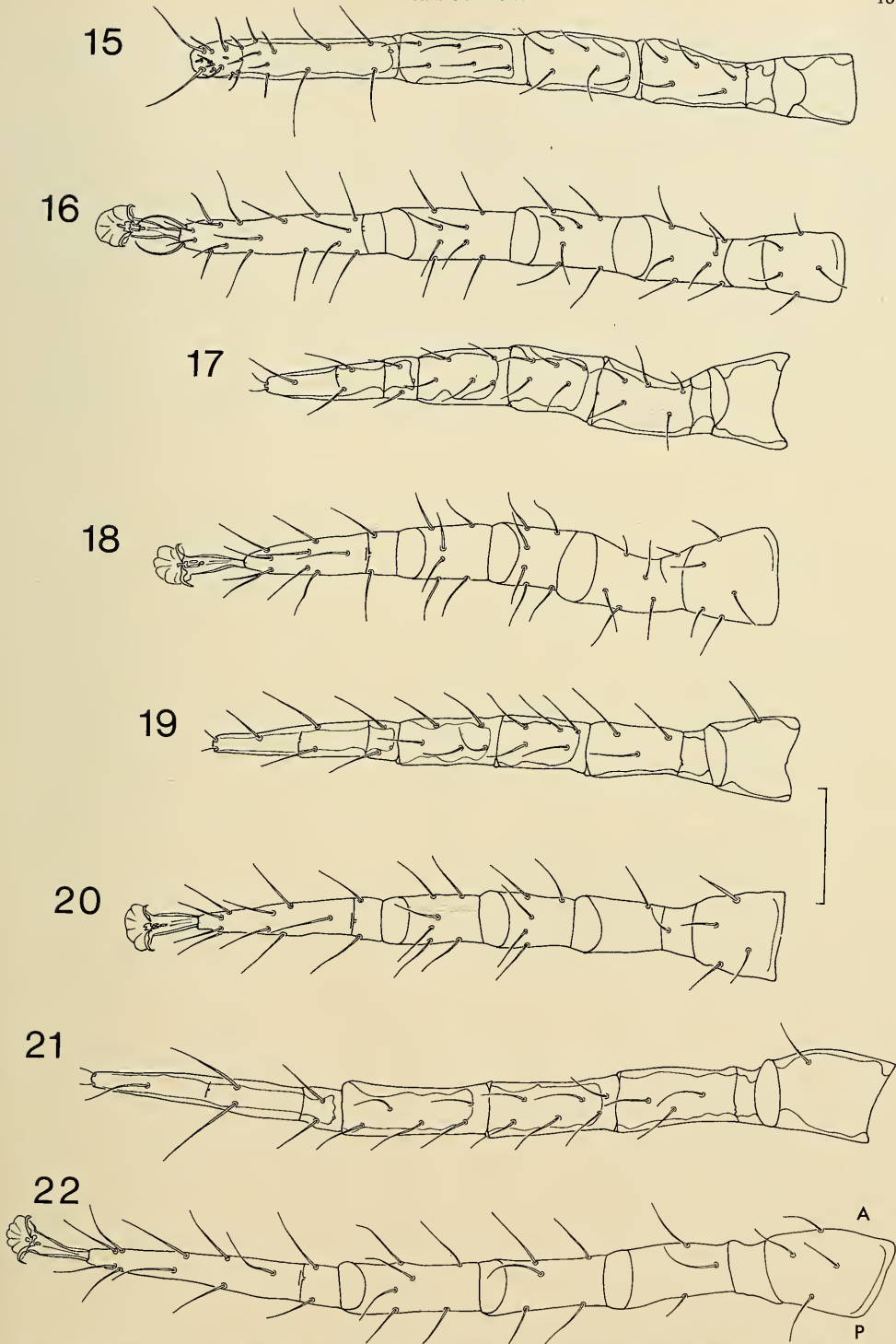
(Figs 1-12, 15-28)

*Types.* Holotype ♀, allotype ♂ and five paratype ♀♀, auditory meatus of domestic goat, *Capra hircus* Linnaeus (Artiodactyla: Bovidae), Lismore, N.S.W., vi.1978, R. W. Cook. Six paratype ♀♀ and one paratype ♂, auditory meatus of *C. hircus*, Byron Bay Lighthouse, N.S.W., vi.1978, R.W.C. One morphotype larva, auditory meatus of *C. hircus*, Tuncester, near Lismore, 17.viii.1979, R.W.C. In ANIC (holotype, allotype and morphotype); BMNH, QIMR, RVL (paratypes).

*Female.* Chelicerae 175 µm long overall, with digits occupying 26% of total length; middle segment with distinct dorsal setule, dorsal and external lyriform pores, and ventral corona; fixed digit with only one distinct denticle in addition to tip, pilus dentilis apparently absent; movable digit 45 µm long, with two external denticles at level of tip of fixed partner. Epistome hyaline, in shape of inverted U, barely reaching level of bases of palpal femora, with two or three small serrations distally. Basis capituli wider than long, with a few short lines of denticles in addition to eight stronger rows in deutosternum; setae *c* simple, slender, exceeding sides of basis (often broken off short, as are all setae on body and appendages, except the shortest). Hypostome with setae  $h_{1-3}$  subequal to *c*; cornicles not heavily sclerotized, but distinct (albeit somewhat irregular in outline); internal malae not clear; epipharynx as in *R. australis*; salivary stylets present; anteromedial extension of subcheliceral shelf not clearly seen (cf. *R. australis* above). Palpi strong; genu with lyriform pore dorsally, tarsus with bifid claw (*n.b.*: small seta immediately above claw is also tarsal); trochanter-genu holotrichous ( $al_1$  on genu spatulate), tibia bifid (two dorsodistal rods included), tarsus discrete, with usual few simple setae and terminal cluster of rods.

Idiosoma saccate, size unavailable because of rupture during mounting procedure. Dorsal shield 585-640 µm long, 230-255 µm wide (ratio L/B 2.51), poorly demarcated from investing strip of sclerotized cuticle, sides subparallel, ends broadly rounded; surface heavily marked by muscle insertions, otherwise granulate, with about 15 pairs of pores (anteriormost pair lyriform); podonotal portion hypotrichous, with 10 pairs of setae; opisthonotal portion hypotrichous, with seven pairs of setae (one *J* seta doubled on one side of one specimen). Dorsal cuticle largely hyaline, with about 12 pairs of setae and a few paired pores.

Tritosternum fully formed, with ciliated laciniae just exceeding insertions of setae  $h_3$  on capitulum. Presternal striae absent. Sternal shield longer than wide, with somewhat irregular margins (one specimen with small submedian fenestration at level of setae  $st_3$ ); surface minutely granulate, provided submarginally with three pairs of setae ( $st_{1-3}$ ) and two pairs of pores ( $p_{1-2}$ ,  $p_2$  absent on one side of one specimen). Metasternal setae (*mst*) free in cuticle, without associated pores ( $p_3$ ) or shields. Genital shield small, drop-shaped; surface granulate, marked by muscle insertions, and with one pair of setae (*g*) touching on margins (well free of margin on one side of one specimen), but associated two pores and shieldlets free in cuticle; operculum shallow, but rayed, supported by two strong genital apodemes. Insemination apparatus visible as convoluted adductor canals arising from sclerotized prominences on posterior margins of coxae III. Ovum very large, 760-800 µm long, 540-565 µm wide, some containing fully developed larva. Anal shield terminal in engorged specimens, with cribrum encroaching onto dorsum; surface weakly granulate, with pair of pores laterally; anus and adanal setae (*aa*) well forward, postanal seta (*pa*) subequal to *aa*. Irregular endopodal and exopodal shieldlets present between and behind coxae. Metapodal shields present, but largely subcuticular. Ventral cuticle with about six pairs of setae and a few paired pores. Stigmata provided with stout

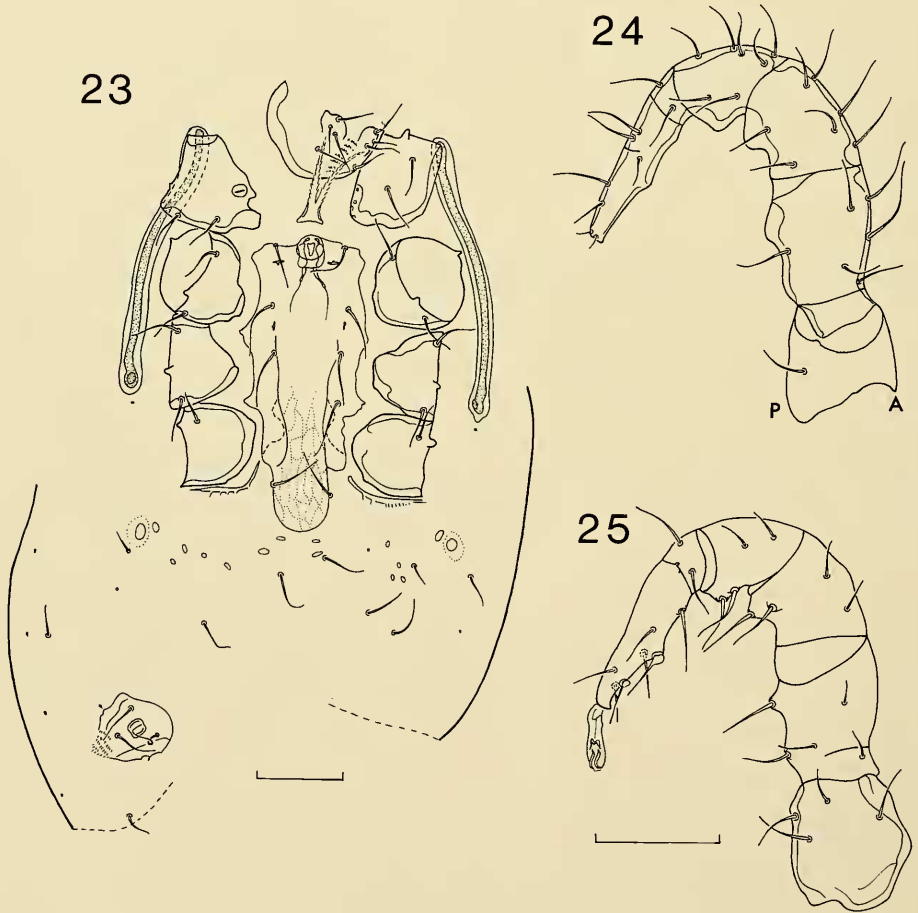


Figs 15-22. *Raillietia manfredi* ♀, legs. 15-16. I, dorsal, and ventral and lateral setation. 17-22. II-IV, same presentation as I. Scale = 100  $\mu$ m.

peritremes that, while largely ventral, turn finally dorsad onto humeral promontories; peritrematal shields anteriorly slightly expanded mesad, but free of dorsal shield and, posteriorly, of expodal shields IV.

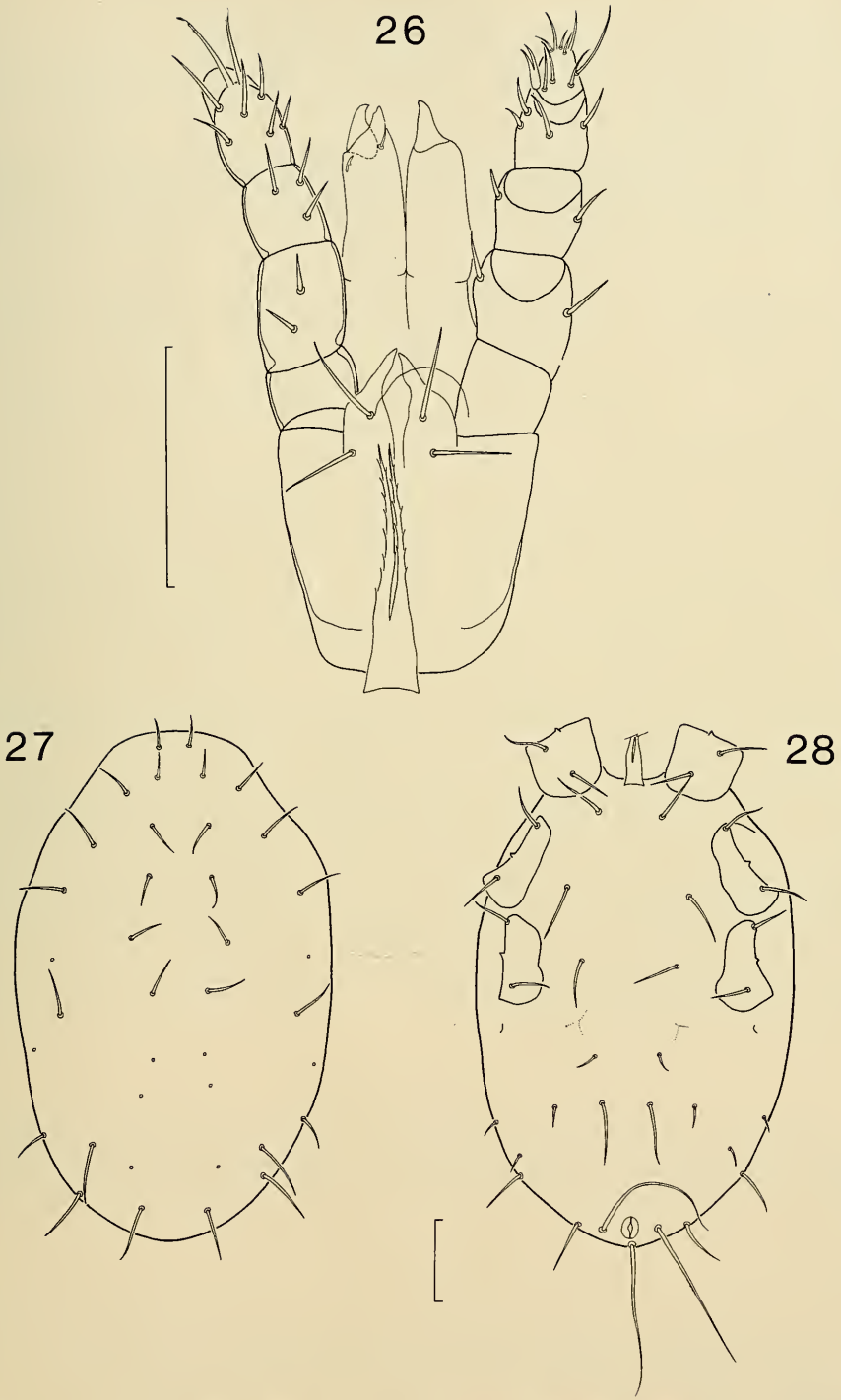
Legs slender, with following deviations from holotrichous condition — hypotrichous: trochanter I 1-0/3-1 (*d* lacking), femora I 2-3/1.2/2-2 (one *pv* lacking), III 1-2/1.1/0-0 (*pl* lacking); hypertrichous: genua III 2-3/1.2/1-1 (*ad*<sub>3</sub> added; individual variation: *pl*<sub>2</sub> at times also added), IV 2-3/1.3/0-2 (*ad*<sub>3</sub> and *pl*<sub>2</sub> added); tibiae I 2-3/2.3/2-2 (*pv*<sub>2</sub> added), II-IV 2-2/1.3/1-2 (II with *pd*<sub>3</sub> added; III with *ad*<sub>2</sub>, *pd*<sub>3</sub> and *pl*<sub>2</sub> added; IV with *ad*<sub>2</sub> added). Femora-genua I-II without any *d* seta unduly strengthened. Tarsus I with dorsodistal sensory islet occupying 25% of length of segment. Coxa II without spinose anterodorsal process in addition to usual two condyles. Ambulacra with two claws and pulvillus.

*Male*. Capitulum as in ♀, except for slightly stronger setae on palpal trochanter-tibia and secondary sexual characteristics of chelicerae. Shafts thicker and more heavily sclerotized, but proportions unavailable because of foreshortening; fixed digit



Figs 23-25. *Raillietia manfredi* ♂. 23. Idiosoma, ventral. 24-25. Leg II, dorsal and posterolateral, and ventral and anterolateral setation. Scales = 100  $\mu$ m.





Figs 26-28. *Raillietia manfredi* larva. 26. Capitulum, ventral (true right chelicera and palp dorsal). 27-28. Idiosoma, dorsal and ventral. Scales = 100  $\mu$ m.

obsolescent, but dorsal setule and at least external lyriform pore present; spermatodactyl strongly bidentate, apart from tip, *ca* 85  $\mu\text{m}$  long.

Idiosoma saccate, of uncertain size. Dorsum as in ♀, except that dorsal shield is wider, 605-615  $\mu\text{m}$  long, 260-265  $\mu\text{m}$  wide (ratio L/B 2.33) (seta  $J_1$  doubled on one side of one specimen).

Sternogenital shield with cornua slight, genital aperture in midanterior margin; strongly sclerotized laterally between coxae III-IV, otherwise granulate, except for weak reticulations on genital portion; with five pairs of setae and two pairs of pores as in ♀ (one *mst* seta absent on one side of one specimen). Venter otherwise essentially as in ♀.

Legs with same setational formulae as in ♀, with some individual variation: one specimen with femur III 1-2/1.2/0-0 (*pd*<sub>2</sub> added, *pl* lacking) on one side and tibia I 2-3/2.3/1-2 (holotrichous) on both sides. Legs I, III-IV slender, II incrassate, with *pv*<sub>1-2</sub> on femur, *av* and *pv* on genu-tibia, and (to varying extent) *av*<sub>1-3</sub> on tarsus strengthened and set on prominences (*av*<sub>1-2</sub> on tarsus also strongly inflated basally).

*Nymphs*. Unknown.

*Larva*. Chelicerae 100  $\mu\text{m}$  long overall, with digits occupying 25% of total length; middle segment with dorsal setule and external lyriform pore, but dorsal pore and corona not detected; digits edentate, pilus dentilis apparently absent. Epistome as in ♀, but margin almost smooth. Basis capituli as long as its maximum width, deutosternal details not clear. Hypostome with setae *h*<sub>1-2</sub> subequal; cornicles pale, but distinct; other hypostomatal structures not clear. Palpi strong, genu without lyriform pore dorsally, tarsus with bifid claw; trochanter-tibia holotrichous (*al*<sub>1</sub> on genu slightly spatulate), tarsus much as in ♀.

Idiosoma ovate, 650  $\mu\text{m}$  long, 405  $\mu\text{m}$  wide. No distinct shield evident, but dorsum with at least five pairs of pores; podonotal portion holotrichous, with 10 pairs of setae; opisthonotal portion hypotrichous, with four pairs of setae.

Tritosternum fully formed. No distinct shields evident on venter. Setae *st*<sub>1-3</sub> subequal. Setae *aa* flanking anus, only slightly shorter than *pa*, with strong tendency to elongation as in other halarachnine larvae, e.g. *Halarachne* Allman and *Orthohalarachne* Newell (see Domrow, 1962, 1974). Ventral cuticle with three pairs of lateral setae in addition to usual three pairs of midventrals and pair flanking anal complex; with metapodal traces and duct-like structures seen in *Orthohalarachne*.

Legs holotrichous, otherwise much as in ♀.

*Notes*. This is the first species of *Raillietia* to be described from a caprine rather than a bovine member of the family Bovidae.

#### ACKNOWLEDGEMENTS

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